ATTACHMENT C

FWS Comments to EPA (June 27, 2002)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Washington, D.C. 20240

ADDRESS ONLY THE DIRECTOR
FISH AND WILDLIFE SERVICE

In Reply Refer To:
FWS/AFHC/DEQ

June 27, 2002

Ms. Kimberly Nesci Lowe
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Public Information and Records Integrity Branch
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U.S. Environmental Protection Agency
1200 Pennsylvania Avenue
Washington, D.C. 20460

Dear Ms. Lowe:

The U.S. Fish and Wildlife Service appreciates the opportunity to submit the following comments to the U.S. Environmental Protection Agency regarding your recently completed risk assessments conducted to support the re-registration review for atrazine (EPA DOCKET CONTROL NUMBER OPP-34237C). The following comments pertain specifically to the Ecological Risk Assessment included in the Environmental Fate and Effects chapter. We have also included some risk reduction measures that EPA should consider requiring if atrazine is re-registered.

BACKGROUND

Atrazine is a triazine herbicide used for broadleaf and grassy weed control and works by controlling photosynthesis in target plants. It is the most commonly used agricultural pesticide in North America (Eisler, 2000). Nearly 77 million pounds of this herbicide are applied annually.

Atrazine is registered for a wide range of crops, including corn, sorghum and sugarcane, among others, although the crops listed above account for approximately 99% of the atrazine used in this country. Atrazine can be used in both pre-emergent and post-emergent applications and can be applied as emulsifiable or flowable concentrates, a water-dispersable granular, a soluble concentrate, a wettable powder, or in a ready-to-use formulation.

Atrazine has a number of characteristics that cause its release into the environment to be problematic from the Service's perspective. Atrazine can enter the atmosphere via volatilization and spray drift and can be aerially deposited. It is commonly detected in rain samples, and it has even been detected in fog. Since it is highly mobile in various environmental media, it can also be transported via spray drift and runoff to surface water, and can leach to groundwater. Atrazine is also persistent in aquatic systems, so the potential for further migration of the chemical is enhanced, and chronic exposure may occur to a wide range of biota.

Summary of Ecological Risks

Because of atrazine's widespread and heavy use, its virtually ubiquitous presence in surface and groundwater, and its toxic potential to a wide range of species, EPA has concluded that the continued use of atrazine is likely to pose a risk to the health and integrity of some aquatic communities.

Specifically, EPA has concluded that the continued use of atrazine may pose risks in the form of the following non-targeted impacts:

- reduced primary productivity
- reduced populations of aquatic macrophytes, invertebrates, and fish
- loss of sensitive species in aquatic communities and changes in community structure and function
- acute and chronic risks to birds and mammals
- moderate acute toxicity to fish and high acute toxicity to aquatic invertebrates
- chronic toxicity to both fish and invertebrates
- high acute toxicity to terrestrial and aquatic plants (including algae and vascular plants)
- direct acute toxicity in many plant species resulting from spray drift and agricultural runoff

GENERAL COMMENTS

On Page 11 of the ERA, EPA discusses reasons why it does not accept the results of an earlier atrazine risk assessment (Giddings et al., 2000) in which it was concluded that surface water concentrations of 50 micrograms per liter or less would not harm aquatic communities. Essentially, EPA believes that the authors of the earlier report ignored important data and focused on the wrong toxicological data. EPA argues for the need to collect species specific data, and states that, in order to evaluate how atrazine affects reproduction in plants, it is necessary to conduct studies that focus specifically on plant reproduction. EPA also argues that "there are inevitably other herbicides present in contaminated water bodies whose combined effects would act to lower the effective levels at which individual chemicals such as atrazine cause impact."

The Service strongly agrees that pesticide risk assessments need to take into account the fact that pesticides are likely to become mixed with other chemicals, including other pesticides, once they are released into the environment. Risk assessments that fail to address this issue are likely to underestimate the true potential for ecological impacts, and as such, this represents a critical data gap that EPA needs to address. The Service believes that EPA's pesticide risk assessments do not address several other important data gaps as well, including:

Sublethal Effects. Toxicity studies included by EPA in its final risk calculations for pesticide registrations often are limited to measures of acute mortality, or the pesticide concentrations at which short-term exposure will result in significant mortality in the test organism population. Due to this narrow focus, the ability of a pesticide to elicit a wide range of important sublethal effects often are not known. Furthermore, the Service believes that setting protective levels for pesticides in the environment based on their ability to prevent increased acute lethality is an inadequate level of protection. Certainly, the use of registered pesticides should not result in the death of non-target organisms, but such use should also not cause other impacts in these organisms, such as altered reproductive capacity.

Use of Surrogate Species. EPA generally requires registrants to submit data on toxicity tests from a limited group of standard test species. These test species are used to determine the toxic thresholds of pesticides for all species, including endangered and other sensitive species, such as amphibians, mollusks, and reptiles. In most instances the Service does not accept that these species are appropriate surrogates for listed species because different species can have different life histories, biological requirements and sensitivities to pesticides and other toxicants. For example, EPA may use fish toxicity values to draw inferences regarding impacts to amphibians. Furthermore, while a specific toxicological endpoint may be appropriate for one species, it may not be relevant for another. For example, concentrations of a toxicant that can alter reproductive function in a fish but may be directly lethal in some other organism.

"Inert" Ingredients and Adjuvants. EPA focuses on risks associated with the active ingredient of a pesticide formulation. However, pesticide formulations can include a wide range of other ingredients, including so-called "inert" ingredients and various adjuvants designed to increase the effectiveness of the active ingredient. The toxicological effects of these other ingredients are not always known, and since EPA only requires that toxicity testing be conducted on the active ingredient, the toxicity of mixtures of the active ingredient, inerts, and adjuvants is also unknown. These data gaps can result in significant uncertainty when predicting the risks posed by a pesticide.

As indicated above, the Service is particularly concerned that EPA's risk assessment process does not effectively address impacts to sensitive species including migratory birds and endangered species, among others. Recently published research (Hayes et al., 2002) provides ample evidence that EPA's risk assessments should also focus on evaluating risks to amphibians.

Atrazine and Amphibians. The risk assessment (Page 22. VI. Environmental Risk Characterization - Summary) states: "The Agency finds that in areas of high atrazine use, there is widespread environmental exposure that (1) has resulted in direct acute effects on many terrestrial plant species at both maximum and typical use rates, (2) may have caused direct effects on aquatic non-vascular plants which in turn could have caused reductions in primary productivity, (3) may have caused reductions in populations of aquatic macrophytes, invertebrates and fish, and (4) may have caused indirect effects on aquatic communities due to loss of species sensitive to atrazine and resulting in changes in structure and functional characteristics of the affected communities. Potential adverse effects to sensitive aquatic plants and other non-target aquatic organisms as well as their communities, are likely to be greatest where atrazine concentrations equal or exceed approximately 10 to 20 micrograms per liter on a recurrent basis or over a prolonged time period."

The risk range presented above (10 to 20 micrograms per liter) was not based on risks to amphibians. Since recent research has linked exposure to atrazine at environmentally realistic doses to various effects in amphibians, on the order of 0.1 micrograms per liter, risks posed to amphibians by atrazine should be a critical element of this ERA.

Aquatic systems that have fish often lack amphibians and vice versa. In Murphy et al. (2000), several citations are listed for the predatory effects on amphibians by fish such as bluegill (*Lepomis* sp.), large- and smallmouth bass (*Micropterus* spp.), trout (*Salmo* spp. and *Onchorynchus* spp.), perch (*Perca* spp.), and pike (*Esox* spp.). The text states that "many anuran species cannot coexist with such predatory fish." Therefore, an aquatic community with amphibians is likely to be much different than an aquatic community with fish.

Many amphibian larvae subsist on algae and other phytoplankton, therefore, adverse effects to aquatic plants could have adverse effects to amphibians. This is particularly important because of the dramatic decline in amphibian populations worldwide (Blaustein and Wake 1990; Griffiths and Beebee 1992; Corn 1994; Vertucci and Corn 1996).

A recently published and highly publicized report (Hayes et al., 2002) showed that exposure of African clawed frogs, *Xenopus laevis*, to atrazine at very low, but environmentally relevant doses could result in altered sexual development. The authors found exposure to atrazine concentrations of 0.1 micrograms per liter resulted in the production of hermaphroditic frogs. Exposure at 1.0 micrograms per liter resulted in reduced laryngeal size. The likelihood that natural populations of amphibians would be exposed to concentrations in this range is quite high.

Atrazine and other soluble pesticides (simazine, carbaryl, prometon, metolachlor, and diazinon) have been found in spring habitat of the endangered Barton Springs salamander (*Eurycea sosorum*) in downtown Austin, Texas. The U.S. Geological Survey has detected these pesticides in the salamanders' spring habitat by analyzing filtered water samples during rainfall events. The pesticides are carried into salamander habitat by surface runoff from residential lawns, municipal parks and golf courses in the Austin metropolitan area. Atrazine and the other pesticides have been detected in both spring water and surface water of the salamander habitat over a period of one to two weeks at levels that range from non-detect to a high of 3.19 micrograms per liter. Twenty seven percent of samples collected by USGS to date have shown atrazine to occur in concentrations of at least 0.1 micrograms per liter. Effects on the endangered Barton Springs salamander by atrazine and other runoff pesticides during rainfall events are currently not known; however, the presence of atrazine in salamander habitat may be significant in view of the African clawed frog data presented above.

At a minimum, the information presented above calls into question the ability of the 10-20 micrograms per liter risk range proposed by EPA to protect sensitive species. In order to adequately determine the effects of atrazine on amphibians at these concentrations, EPA needs to require that registrants conduct amphibian testing.

Bioaccumulation. The potential for bioaccumulation is not adequately addressed in the risk assessment. One paragraph in Appendix XI (Page 13. Ecological Effects Characterization - Bioaccumulation in Fish) discusses bioaccumulation in bluegill during a 28-day exposure in a flow through system in which atrazine concentrations decreased in fish tissue after depuration. However, the risk assessment should discuss bioaccumulation with consideration to the following points.

- There is no discussion regarding the bioaccumulation of atrazine through long-term exposure in fish where depuration is not an option.
- There is no discussion as to whether atrazine can be accumulated in food sources and transferred via the food web to fish rather than solely through the water.
- There is no discussion on the potential for bioaccumulation in amphibians. One study by Allran and Karasov (2000) found that "atrazine concentrations in metamorphosed leopard frog juveniles were approximately six times the concentration in the water, indicating bioconcentration of atrazine by larvae." The leopard frog larvae were exposed to atrazine at 0, 20, and 200 micrograms per liter from first-feeding state through metamorphosis.

SPECIFIC COMMENTS

Page 4, Mechanism of Action. EPA states that atrazine's mechanism of action is the inhibition of photosynthesis. However, this is only the herbicide's intended mechanism of action. There are also other modes of action, for example, endocrine disruption, on non-target organisms (e.g., birds, mammals, insects, amphibians, etc.). This information needs to be included in this section as well, since the primary purpose of this risk assessment is to evaluate the risks to non-target species.

Page 7, Terrestrial Risk Characterization (Birds and Mammals). EPA states that methods are not available to determine the levels of atrazine that could occur in soil and in earthworms and other soil organisms that are used as food sources by birds and mammals. This statement is simply not true. Soil concentrations of atrazine can be directly measured following application, or could have been at some point in the last 30 plus years that atrazine has been registered. Earthworm bioaccumulation tests are routinely conducted in commercial testing laboratories. Predictive models, if not already available, could be easily developed based on empirical data on soil and earthworm tissue concentrations.

Page 8, Terrestrial Risk Characterization (Plants). EPA states that while only toxicity to crop species is tested, they assume that the results are representative of a range of wild plants. No evidence is provided or cited to support this assumption. Considering the amount of human manipulation involved in the development of crop species, the validity of the assumption that crop plant species can be used as surrogates for naturally occurring species in toxicity tests is questionable.

Page 11, Atrazine Effects Characterization (General). In an earlier atrazine ERA (Giddings et al., 2000), it was stated that sensitive species lost following exposure to atrazine would be replaced with less sensitive species having the same ecological function. However, it should be noted that risks, such as alterations in aquatic community structure, cannot be explained away or have their significance minimized by assuming that lost sensitive species would simply be replaced by other, non-sensitive species. Loss of sensitive species, including but not limited to threatened and endangered species, should be viewed as a significant ecological impact.

Page 24, Exposure Characterization (Streams). The first sentence in this section begins "streams receive pulses greater than this level..." However, it is not clear what is meant by "this level."

Page 26, Risk Characterization for the 1989 Post-Application Stream Monitoring Data. The final sentence of the paragraph reads "Primary production is also estimated to occur in approximately 755 of the streams." Should this sentence actually be "Reductions in primary production..."?

Page 41, Toxicity of Degradates Compared to Atrazine. The second sentence in this section refers to available toxicity values. Should this actually refer to toxicity ratios? Also, the subsequent table entitled "Toxicity Comparison of Atrazine with its Degradates" is virtually incomprehensible.

Page 54, Pond Assessment. Percent of pesticide loadings from different sources to the standard pond are presented in a table. Sources listed include run-off, erosion, and spray drift. Earlier in the document EPA discussed the potential for aerial deposition following volatilization, but this route does not appear to have been considered in this section.

Page 74, Endangered Species Concerns. The Service agrees with EPA's contention that herbicides may have significant effects on the suitability of aquatic areas as habitats and sources of food for endangered as well as other species. In fact, this contention may be supported by an earlier observation on Page 58 (Evidence of Community-Level Pond Effects from Field Data) in which EPA states that artificial ponds treated with atrazine at 20 micrograms per liter showed significant community-level impacts that would not have been predicted by environmental effects concentrations based on single species toxicity tests. Altering a single key group within a biological community can alter the entire community.

RECOMMENDATIONS FOR RISK MITIGATION

In the event that EPA re-registers atrazine for its current uses, the Service believes the restrictions on its use listed below will result in substantial risk mitigation. However, the Service does not believe that the measures listed below will eliminate all risks associated with the use of this pesticide, nor do we believe that EPA has been fully successful in characterizing these risks.

- Atrazine should be applied prior to planting, using shallow soil incorporation (1-3 inches deep)
- Post-emergent applications should be limited to drop nozzle applications when wind speeds are below 7 miles per hour; aerial applications should be prohibited
- spray applications should be prohibited during temperature inversions
- Due to its mobility and persistence, atrazine should not be applied within 200 feet of water bodies, including flowing streams and wetlands (particularly vernal pools)
- Atrazine should not be applied on sandy or loamy soil
- Monitoring plans should be developed to specifically evaluate the efficacy of best management practices; if atrazine is still migrating to non-target areas even after implementation of BMPs, consideration should be given to severely restricting its use in open environments

Finally, due to an inability to fully characterize and assess the ecological risks posed by atrazine, it does not appear that EPA will be able to fulfill its legal responsibilities under section 7(a)(2) of the Endangered Species Act to ensure that its proposed re-registration action is not likely to jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat. For this reason the Service strongly recommends that prior to attempting to re-register atrazine and entering into a section 7 consultation, that EPA work with the Service to develop sufficient information to adequately evaluate atrazine's effects on listed species.

Thank you again for the opportunity to provide comments to EPA on the re-registration of atrazine. We look forward to working closely with you on this and future document reviews related to the pesticide re-registration process. If you have any questions, or require any additional information, please contact Ken Seeley, Division of Environmental Quality at (703) 358-2148.

Sincerely,

Everett Wilson

Everett Wilson, Chief
Division of Environmental Quality

LITERATURE CITED

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